AD-A169 465 REQUIRED OPERATIONAL CAPABILITY (ROC) LOG 021513 FOR A 1/1
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25 APR 86 USMC-ROC24-04-01

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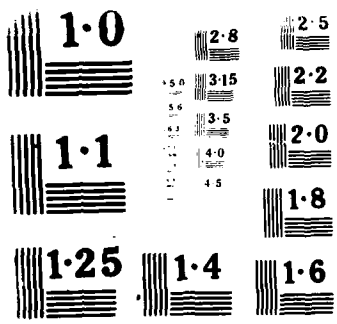

DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380-0001

IN REPLY REFER TO
3900
ROC24-04-01
25 APR 1986

From: Commandant of the Marine Corps

Subj: REQUIRED OPERATIONAL CAPABILITY (ROC) LOG 0215.1.3 FOR A TRAILER LAUNCHED BRIDGE

Ref: (a) MCO 3900.4B

Encl: (1) ROC No. 0215.1.3 for a Trailer Launched Bridge

1. This letter establishes ROC LOG 0215.1.3 for a Trailer Launched Bridge (TLB). The ROC has been developed in accordance with the reference and is contained in the enclosure.

2. The Commanding General, Marine Corps Development and Education Command (Director, Development Center) is the Marine Corps point of contact for the development efforts pertaining to the TLB.

Distribution:
(See attached)

RAY "M" FRANKLIN
Major General U.S. Marine Corps
Deputy Chief of Staff for [illegible]

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REQUIRED OPERATIONAL CAPABILITY (ROC) LOG 0215.1.3 FOR TRAILER-LAUNCHED BRIDGE

1. STATEMENT OF THE REQUIREMENT. The Marine Corps has an urgent requirement for a multipurpose military load class (MLC) 70, C130 air-transportable trailer-launched bridge (TLB) capable of crossing gaps up to 22 meters in width. The TLB will complement the 19-meter MLC 60 armored vehicle-launched bridge (AVLB) and medium girder bridge (MGB) in providing sufficient combat support and service support bridging capabilities to the Marine air ground task force (MAGTF) at natural gaps and at damaged or destroyed bridges along main supply routes. For cross-country transportation and employment, the TLB will be towed by combat vehicles such as an AVLB, combat excavator, tank retriever, the battle tank (M60 or M1), and the logistics vehicle system (LVS) MK48/14. The TLB will be organic to the combat engineer battalion, Marine division, and engineer support battalion of the force service support group (FSSG). An initial operational capability (IOC) of FY91 is required. Desired date of full operational capability (FOC) is FY92.

2. THREAT AND OPERATIONAL DEFICIENCY

a. Threat. Potential and enemy threats confronting the United States in the near-to-long range periods are fully developed in the Marine Corps Long Range Plan (MLRP) of 6 June 1982 and the Marine Corps Midrange Objectives Plan (MMROP) of 8 November 1984. An analysis of the threat discussed in these documents reveals a modern, highly mobile military force, with sophisticated weaponry and equipment capable of employment under diverse climatic and terrain conditions. Especially significant capabilities of the threat or its surrogates include the ability to use natural obstacles and create networks of ditches, complemented by other nonexplosive obstacles as well as minefields in offensive and defensive operations. Emphasis is on slowing, disrupting, and channelizing the enemy by rapidly emplaced obstacles and minefields and engaging them with a large volume of supporting arms fire.

This threat, coupled with sophisticated target acquisition and surveillance capabilities, improved weapon accuracy, and shortened weapon response time, requires that Marine Corps gap-crossing of natural and threat-created gaps be accomplished without loss of momentum. Strategic and tactical mobility of Marine Corps gap-crossing support is essential to insure success for all elements of the MAGTF.

b. Operational Deficiency. Current Marine Corps gap-crossing equipment does not provide the mobility required by MAGTF forces.

(1) No single bridge exists which can provide the capability to span gaps of various widths which will confront MAGTF forces. The development of various CS/CSS mechanized bridges capable of emplacement under fire and spanning a variety of gaps is required.

(2) The acquisition of the AVLB will provide an assault bridging capability in the near term. However, the limited quantities of AVLB's programmed for acquisition will only marginally support the GCE. The AVLB is considered solely an assault bridge organic to, and for use by, armored units. Generally, each MAF will be equipped with six AVLB's. Given the limited number of AVLB's to be fielded, loss of a single chassis could have a significant impact on the gap crossing capability of the force.

(3) In order to provide the MAGTF commander with the required gap-crossing capabilities, the AVLB must be complemented by other bridging assets that can provide an in-depth capability throughout the objective area in sufficient density to ensure a gap-crossing network extending from the zone of action to the logistic base/rear area. Rapid mobility on the battlefield and the anticipated high tempo of combat will place great demands on both CS and CSS. CSS must be as flexible and mobile as the combat element requiring support.

(4) Improvements in MLC, length, survivability, repairability, and strategic mobility for such bridging are necessary. A battleworthy MLC 70, C130 air-transportable TLB will provide MAGTF units with the capability of reinforcing AVLB's with an MLC 70 CS/CSS bridge.

(5) Significantly, the AVLB could tow the TLB and be capable of employing two bridges without another tow vehicle. Thus, the combat effectiveness of a relatively small number of AVLB can be dramatically enhanced by a TLB. The TLB, working in conjunction with the AVLB and MGB, will provide the MAGTF commander the maneuver and mobility options and flexibility required when confronted with varying natural and man-made gap obstacles.

3. OPERATIONAL AND ORGANIZATIONAL CONCEPT

a. Operational Concept. The TLB will be employed as an integral part of a mix of dry gap bridges which may eventually include the AVLB/TLB, towed assault bridge (TAB) (see paragraph 7a), and the MGB. The TLB system will consist of a 24-meter length bridge capable of spanning a 22-meter gap, a bridge launcher, and a towing and/or employment vehicle.

(1) Incident to hostile fire conditions, the TLB may principally be employed by the AVLB or a combat excavator. It may also be employed by the main battle tank. The LVS MK48/14 vehicle can preposition a TLB at an assembly area or line of

departure. For a breaching mission at a gap where a minefield(s) exist, the TLB will be pushed into its launch position by a combat vehicle. If no mines are anticipated, the bridge will be towed and then backed into its emplacement position by the employing vehicle. Employment of the TLB must be in concert with other obstacle breaching efforts including the overcoming of explosive obstacles (mines) and nonexplosive obstacles such as blast rubble, log and steel posts, and wire.

(2) The TLB launcher will also be able to employ the AVLB bridge as well as the Army's future 32-meter heavy assault bridge (HAB) (see paragraph 7b). This is an important capability in at least two tactical situations: first, when a serviceable AVLB or HAB bridge must be removed from a damaged tank chassis launcher; and second, when emplaced AVLB or HAB bridges must be retrieved and delivered farther forward while the tank launcher chassis are involved in launching other bridges in the zone of action.

(3) The TLB will provide rapid combat support and service support follow-on bridging at natural gaps or at damaged/ destroyed bridges when the tactical situation does not permit the hand-erection of MGB combat service support bridging. The TLB will be left in place to allow the transit of follow-on forces until the tactical situation permits the erection of MGB bridging.

(4) In non-assault conditions, the TLB can be employed and retrieved utilizing the weight and towing capabilities of the LVS MK48/14. The TLB can also be towed on primary and secondary roads by the AAV7A1 family and the five-ton series of tactical vehicles.

(5) The combat engineer battalion will utilize the TLB as a rapidly employable, temporary combat support bridge. The engineer support battalion (bridge company) can utilize the bridge as a short-duration combat service support bridge to complement the MGB, especially at damaged bridges on main supply routes.

b. Organizational concept. The requirement is for four TLB's in the combat engineer battalion, Marine division, and three TLB's in the engineer support battalion, FSSG. The Marine Corps TLB acquisition objective is 41, to be distributed as follows:

Unit	TLB Allow	Total
Marine Division (Combat Engr Bn) (one per engineer company)	4 ea	16
FSSG (bridge company) (one per platoon)	3 ea	12
Formal schools	2	2

Maritime prepositioned shipping*	1 per BDE	3
Operational readiness float (ORF)	1 per MAF	3
GEO prepositioning (Norway)	1	1
Planned war reserves (PWR)		4
		41

* Pending space availability.

4. ESSENTIAL CHARACTERISTICS. In order to provide essential combat effective and survivable combat support as well as combat service support bridging assets, the TLB will possess the following performance characteristics:

a. The bridge shall span a gap of at least 22 meters without exposure of personnel when employed by combat vehicles and shall be rapidly launchable. A launch time of five minutes or less is desired (from the time the launcher is in its final position at the gap site).

b. The bridge shall be rapidly recoverable from either side of the gap with minimal exposure to personnel. A recovery time of less than 10 minutes is desired.

c. The bridge shall be air-transportable by C130 and larger cargo aircraft and conform to physical characteristics outlined in Air Force Transportability Handbook AFSC DH-1-11. This requires that the TLB system gross weight will be no greater than 35,000 lbs (ideally not greater than 31,000 lbs.).

d. Under assault conditions, the TLB must be capable of being emplaced and retrieved by the AVLB, combat excavator, tank retriever, or main battle tank. Additionally, the TLB must be capable of being transported, employed, and retrieved by the Army's future HAB system which will be mounted on a tank chassis.

e. Under non-assault conditions and given a sufficient cargo load as a counterweight (10,000 lbs) on the LVS MK48/14, the TLB system will be launched and recovered when attached to either the front or the rear of the vehicle. An attachment will be provided for the front of the LVS. On highways and secondary roads, the TLB system will be capable of being towed by the M900 5-ton dump truck and the amphibious assault vehicle (AAV).

f. The TLB trailer:

(1) Must be specifically designed to provide a combat effective, combat suitable and battleworthy transportation, launch, and retrieval system for the TLB, HAB, and AVLB bridges.

(2) Shall be capable of being disconnected from

employment vehicles by mechanical means without exposure of personnel. A backup disconnect system is also required.

(3) "Run-flat" tire inserts shall be required.

g. The TLB will be capable of being launched and crossing traffic with a required single direction uphill slope of 20° or a downhill slope of 10° (longitudinally) and desired single direction slopes of 30° and 20° for uphill and downhill, respectively (Trilateral Code).

h. The bridge will be capable of being emplaced and crossing traffic on traverse slopes including irregularities ± 1 in 20 at one end and $\pm$ 1 in 20, at the other end. Slopes of $\pm 1/10$ at one end and $\pm 1/10$ at the other end will be evaluated for the bridge system (Trilateral Code).

i. The bridge roadway must have dimensions or features that permit the passage of vehicles of MLC 70 that would normally be permitted by conformance to STANAG 2021. A TLB trailer towed by an appropriate tow vehicle shall be able to cross an emplaced TLB (Trilateral Code).

j. The bridge must have curbing or equivalent characteristics, e.g., captivated treadway, in sufficient height and strength to preclude vehicles from sliding off the bridge.

k. The TLB system must possess mobility and maneuverability compatible with the force it is supporting.

l. The TLB must be capable of being removed (deployed) from a battle damaged trailer or HAB chassis and recovered and employed by another TLB or HAB system providing that the bridge (proper) and the launching mechanism of the damaged transporter system are functional. It is desirable that the TLB possess "on-equipment material" (OEM) to enable it to access the hydraulic system of the HAB or another TLB system.

m. The system will possess an MLC 70 crossing capability throughout the design life of the bridge. The life of the bridge is defined as 5,000 normal crossings of an MLC 70 load.

n. The TLB must be capable of being towed over undulating terrain where trailer wheels might be intermittently forced to lose contact with the ground.

o. The TLB's primary operating control systems will be a hand-held control box connected to the launch vehicle by an armored cable and a manual backup system located on the trailer. Additionally, provisions for installation of a wireless remote control operating system as a possible product improvement are

desired. The trailer will be provided with a self-contained power system and will not require hydraulic or electric power from tow vehicles.

p. The bridge and trailer must be capable of being repaired in the field to the maximum extent possible by maintenance personnel utilizing equipment currently in the inventory and projected to be fielded with the Marine Corps and Army. The bridge and trailer will be composed of metals that can be welded with the metallic inert gas (MIG) welding unit. It is desirable that no composite materials shall be employed in the bridge or trailer design except as relatively small replacement items.

q. The system will be capable of being emplaced and operated by individuals wearing NBC and cold weather protective clothing and equipment. The TLB design shall complement the capabilities of standard U.S. military decontamination equipment.

r. The system will be operable and maintainable under climatic types hot and basic as defined in AR-70-83 and under cold climatic design type as defined in AR-70-38 (with a cold weather kit if necessary).

s. The system will comply with applicable safety, health, and human engineering design requirements and not present uncontrolled safety and hazards to personnel. As a minimum, MILSTD's 454, 882, 1472, and 1474 apply.

t. The system will incorporate aids for passage of traffic over the bridge during the hours of darkness.

u. The system must be transportable by rail on standard DoD flat cars and by marine transportation via naval amphibious shipping and landing craft, as well as commercial cargo ships, e.g., roll-on, roll-off vessels.

v. The system will be capable of product improvement in, but not limited to:

(1) Hostile fire protection.

(2) Power and hydraulic systems.

(3) Cold weather operation.

(4) Preprogrammed launch and retrieval function.

(5) Weight reduction.

w. Environmental impact assessment: None.

x. Survivability to nuclear blast is not required.

y. Reliability, Availability, Maintainability (RAM) and Durability

(1) Reliability. The TLB system shall demonstrate a mean time between critical failures (MTBCF) of at least 34 missions as a goal and a desired MTBCF of 55. For testing, a critical failure will be defined as a malfunction which causes abortion of the mission, damage to the system by continued use, or a safety hazard, all of which cannot be compensated for or repaired by the crew using OEM in 30 minutes. A mission is defined as a 17.66KM road march, emplacement of a bridge, the crossing of 109 combat vehicles (28 of which are MLC 70 loads), and the retrieval of the TLB from the opposite side of the gap. The confidence level threshold and goal for RAM parameters are:

	Confidence Level	Reliability
Goal/Desired	80%	.95
Threshold/Required	80%	.80

(2) Availability. The TLB system shall have a desired operational availability of 85 percent. This provides an 84 percent probability of at least four of the five TLB's in the reinforced Marine amphibious brigade (MAB) utilized in the operational scenario being operationally available at all times. This operational scenario assumed that two AVLB's and five TLB's were attached to the MAB: One AVLB from each of two tank companies; two TLB's from a combat engineer battalion, Marine division; and three TLB's with an attached construction company, engineer support battalion, FSSG.

(3) Maintainability. The TLB system shall have a maintenance ratio of no more than .27 maintenance man-hours per mission. The maintenance ratio does not include either daily inspection or services performed by the operator or crew or cleaning of the bridge, if required.

(4) Durability. The TLB shall be sufficiently rugged in design to withstand military service (less combat damage) time without requiring major overhaul or replacement for 300 emplacements and retrieving cycles, or 5,000 crossings by a class 70 load.

5. INTER/INTRA-OPERABILITY. The TLB possesses a unique capability in that its launcher system can launch and retrieve the bridges of the AVLB, TLB, and HAB. This also applies to the HAB launcher system. The AVLB launcher bridles system is capable of emplacing/retrieving the AVLB bridge only. NATO's Trilateral Design and Test Code for Military Bridging and Gap-Crossing Equipment will set the standards for the bridge design.

6. OTHER WARFARE AREAS CONCERNED. The TLB system will allow assault and assault follow-on units to move across gap obstacles quickly enabling Marine ground combat and combat support units to

move over gaps rapidly instead of waiting for time and manpower intensive combat service support bridging to be moved forward. This will result in a significant increase in mission success rate within Mission Area 211 (Close Combat) and Mission Area 215 (Land Combat).

7. RELATED EFFORTS

a. 12-Meter TAB. The 12-meter TAB is being evaluated by the Marine Corps as a highly survivable assault bridge dedicated to the assault breach of relatively short (3-10 meters wide) man-made ditches with accompanying 2-3 meter high escarpments (spoil) which are normally a part of a threat style hasty or deliberate obstacle network that includes mines. The bridge will be push- or tow-emplaced by combat vehicles (tanks, AAV's, LAV's, etc.) and will be sectionalized for simple, efficient transport by amphibious shipping or by C130 cargo aircraft. The TAB will be able to withstand up to a 50 percent loss of its main structural supports and the total loss of its wheel system due to antitank mines and direct/indirect fire and still fulfill its MLC 70 load carrying mission. IOC is FY91/92.

b. HAB. The HAB is a 32-meter MLC 70 tank-launched bridge being developed by the Army to eventually replace the 19-meter AVLB. The HAB is being designed to operate on a tank chassis. The HAB launcher will be capable of employing the TLB and AVLB bridges. IOC is FY92/94.

8. TECHNICAL FEASIBILITY AND ENERGY EFFECTIVENESS IMPACT

a. Technical Feasibility. The risk of developing a TLB assault bridging system is low.

b. Energy Effectiveness Impact. Development of the TLB system will not adversely impact upon energy critical materials.

9. LIFE CYCLE COST FORECAST. The life cycle cost forecast and detailed estimate are attached as appendix A. Procurement costs (FY87 dollars) for procurement of 41 TLB systems are $17.9 million. The total life cycle cost for 41 systems is $35.8 million over a 20-year period.

10. MANPOWER REQUIREMENTS. The TLB will be maintained within the existing force structure of the engineer battalions and be operated by Marines with MOS 1371 and maintained by 1341/1316 MOS's.

11. TRAINING. Based on a training impact analysis, introduction of the TLB will have the following impact on the Marine Corps training programs:

a. Entry Level. No changes to requirements for MOS 1316, 1341, and 1371. The TLB must not require any special skills or aptitude beyond that currently required for engineer personnel.

b. Basic Courses. Basic courses for MOS 1316, 1341, and 1371 should not be lengthened by more than one day each.

c. Journeyman Courses. Journeyman mechanic and operator courses should not be extended by more than two days each.

d. Combat Engineer Officer (CEO) Course. The CEO Course should not be increased by more than one-half day.

e. Tank/AAV crew training will be conducted by OJT within each MAF. Training materials and manuals will be provided.

12. AMPHIBIOUS/STRATEGIC LIFT IMPACT. The amphibious footprint can best be depicted by comparing old bridging systems against the new/proposed systems for the engineer battalions within a MAF.

OLD [1]	WT (LBS)	CUBE (ft^3)	SQUARE (ft^2)
M6 FIXED HWY	32,049	113,400	12,600
M4T6 FLOATING	871,440	124,200	13,800
FOOTBRIDGE	9,000	7,350	700
TOTAL	912,489	224,950	27,100

NEW/PLANNED	WT (LBS)	CUBE (ft^3)	SQUARE (ft^2)
MGB[2]	950,000	89,600	5,600
RIBBON BR (WET)	600,500	88,900	11,525
TLB (7)	217,000	40,740	3,600
TAB (8)	152,000	25,000	3,800
TOTAL	1,919,500	244,240	24,525

[1] Based on trailer loads.

[2] Based on 70 containers (8'x8'x20') stacked two high (MHE Capability).

Major System: TRAILER LAUNCHED BRIDGE

Date: 01-09-19[illegible]

LIFE CYCLE COST FORECAST

FUNDING PROFILE
In Thousands of FY87 Constant Budget Dollars
(FYDP Dollars in Parentheses)
(1 Oct 85 Escalators)

20 YEAR LIFE CYCLE

	PRIOR YEARS	CURRENT YEAR	BUDGET YEAR	FY88	FY89	FY90	FY91	FY92	TO COMPLETION	TOTAL PROGRAM
Major System										
RDT&E	2,770	1,80E	800	96	0	0	0	0	-67	5,4[illegible]
FYDP Dollars	(	1,738)	(800)	(100)	(0)	(0)	(0)	(0)		
PMC	0	0	0	0	5,8[illegible]4	8,7[illegible]5	0	0	3,7[illegible]5	[illegible]
FYDP Dollars	(	0)	(0)	(0)	6,3[illegible]2	9,94[illegible]	(0)	(0)		
RTYS FUNDED	0	0	0	0	16	25	0	0	0	41
Support:										
Support PMC	0	0	0	0	0	0	0	0	7[illegible]	7[illegible]
FYDP Dollars	(	0)	(0)	(0)	(0)	(0)	(0)	(0)		
MILCON	0	0	0	0	0	0	0	0	0	0
FYDP Dollars	(	0)	(0)	(0)	(0)	(0)	(0)	(0)		
O&MMC	0	0	0	0	26	403	449	346	7,530	8,753
FYDP Dollars	(	0)	(0)	(0)	27)	(436)	(499)	(394)		
O&MMCR	0	0	0	0	0	3	26	16	850	895
FYDP Dollars	(	0)	(0)	(0)	(0)	3)	(30)	(19)		
WPMC	0	0	0	0	0	62	125	125	1,590	1,902
FYDP Dollars	(	0)	(0)	(0)	(0)	63)	(127)	(127)		
RPMC	0	0	0	0	0	7	13	13	161	193
FYDP Dollars	(	0)	(0)	(0)	(0)	7)	(13)	(13)		
NAVY PROC	0	0	0	0	0	0	0	0	0	0
TOTAL PROGRAM	2,770	1,80E	800	96	5,84[illegible]	9,189	613	499	14,13[illegible]	[illegible]64
FYDP Dollars	(	1,73E)	(800)	(100)	6,369)	(10,450)	(669)	(553)		

Major System: TRAILER LAUNCHED BRIDGE Date: 01-09-1986

LIFE CYCLE COST ESTIMATE
(In Thousands of FY87 Constant Budget Dollars)
(1 Oct 85 Escalators)

20 YEAR LIFE CYCLE

PHASE/CATEGORY		SUBCATEGORY	CATEGORY	PHASE
I.	RDT&E PHASE			5,408
II.	INVESTMENT PHASE			18,247
1.	SYSTEM PRODUCTION/PROCUREMENT		18,247	
A.	Major End Item (Contractor)	16,195		
B.	Initial Provisioning/Spares, Repair Parts	108		
C	Government Furnished/Added Equipment	0		
D.	Other Direct System Costs	1,944		
2.	SUPPORT EQUIPMENT PROCUREMENT		0	
A.	Ammunition	0		
B.	Weapons and Tracked Combat Vehicles	0		
C.	Guided Missiles	0		
D.	Comm-Elec Equipment	0		
E.	Support Vehicles	0		
F.	Engineer and Other Equipment	0		
3.	MILITARY CONSTRUCTION		0	

OTHER DIRECT SUPPORT COSTS OF $1.6M ARE BASED UPON ILSP INFO.
INITIAL SPARES COST PROVIDED BY ALBANY.

III.	OPERATIONS AND SUPPORT PHASE			12,109
1.	OPERATIONS		1,818	
A.	Operator Personnel/Training	1,504		
B.	Material Consumption	253		
C.	Energy Consumption	61		
2.	MAINTENANCE		9,762	
A.	Organizational Maintenance	4,739		
1)	Personnel/Training	179		
2)	Maintenance Material	4,560		
3)	Repair Material	0		
4)	Other	0		
B.	Intermediate Maintenance	1,034		
1)	Personnel/Training	223		
2)	Maintenance Material	0		
3)	Repair Material	304		
4)	Other	507		
C.	Depot Repair	0		
D.	Depot Overhaul	3,278		
E.	Unprogrammed Losses	711		
F.	Software Maintenance	0		
3.	INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS		529	
A.	Base Operations	336		
B.	Other Overhead Costs	193		
4.	SUPPORT EQUIPMENT O&S		0	
TOTAL LIFE CYCLE COSTS				35,764

O&S PHASE--Reserves				1,254
1. OPERATIONS			167	
A. Operator Personnel/Training		138		
B. Material Consumption		23		
C. Energy Consumption		6		
2. MAINTENANCE			1,000	
A. Organizational Maintenance		437		
1) Personnel/Training	17			
2) Maintenance Material	420			
3) Repair Material	0			
4) Other	0			
B. Intermediate Maintenance		95		
1) Personnel/Training	21			
2) Maintenance Material	0			
3) Repair Material	28			
4) Other	47			
C. Depot Repair		0		
D. Depot Overhaul		302		
E. Unprogrammed Losses		166		
F. Software Maintenance		0		
3. INDIRECT SUPT, BASE OPS & MAINT, OTHER O/H COSTS			87	
A. Base Operations		69		
B. Other Overhead Costs		18		
4. SUPPORT EQUIPMENT O&S			0	

END

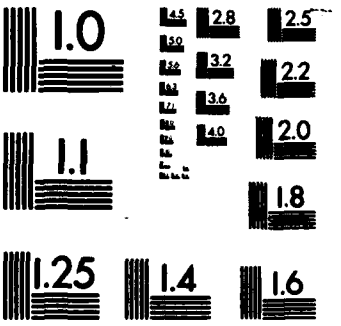
DTIC

7-86

AD-A169 465 REQUIRED OPERATIONAL CAPABILITY (ROC) LOG 021513 FOR A TRAILER LAUNCHED BRIDGE(U) MARINE CORPS WASHINGTON DC 25 APR 86 USMC-ROC24-84-01 2/3

UNCLASSIFIED F/G 13/2 NL

END
FILMED
DTIC



SUPPLEMENTARY

INFORMATION

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P.O. BOX 631
VICKSBURG, MISSISSIPPI 39180-0631

REPLY TO
ATTENTION OF

WESHS-R

10 July 1987

Errata Sheet

No. 1

PRESSURE CALCULATION FOR TWO-DIMENSIONAL
FLOW INSIDE HYDRAULIC STRUCTURES

Miscellaneous Paper HL-86-2

April 1986

1. Page A2, Equation A8: Change the term $\mu\rho^2 u$ to $\mu\nabla^2 u$.

2. Page A2, Equation A13: Change the term $\nu\zeta_y$ to $\nu\zeta_y$.

Subj: REQUIRED OPERATIONAL CAPABILITY (ROC) LOG 215.1.3 FOR A TRAILER LAUNCHED BRIDGE; CHANGE 1

k. Paragraph 4y(2). Delete "MAB" and insert "MEB" in the third sentence of the paragraph.

l. Paragraph 4y(2). Delete "construction" and insert "engineer" in the final sentence of the paragraph.

m. Paragraph 6. Delete "Mission Area 211 (Close Combat) and Mission Area 215 (Land Combat)." and insert "Mission Area 22 (Ground Tactical Mobility), Mission Area 23 (Close Combat), and Mission Area 44 (Expeditionary Engineering)." in the second sentence.

n. Paragraph 11e. Delete "MAF" and insert "MEF" in the first sentence.

o. Paragraph 12. Delete "MAF" and insert "MEF".

3. Filing Instructions. This change transmittal will be filed immediately following the signature page of the basic ROC.

E. T. COOK, JR.

Distribution:
See attached